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en dat de hieraan gehechte stukken overeenstemmen met de oorspronkelijk ingediende stukken.

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De Directeur van het Bureau voor de Industriële Eigendom,
voor deze,

mr. I.W. van der Eijk

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Abstract

A construction unit, such as a bearing unit, comprises at least two metal means
parts which are connected to each other through a connection means which comprises a
5 brazed or a soldered connection. The connection means also comprises at least one
further connection, e.g. a welded, screwed, glued or a plastically formed connection. —

Bearing unit with brazed and welded connection

The invention is related to a construction unit, comprising at least two metal means parts which are connected to each other through a connection means which
5 comprises a brazed or a soldered connection. The brazed or soldered connection can comprise all the known joint designs for welding, brazing and soldering. If appropriate, new or practically applicable joint designs will be developed.

In particular, in a first type, the invention is related to a bearing unit, comprising at least two bearing means which are displaceably supported with respect to each other,
10 wherein the metal means parts of the construction unit are carried out as bearing means parts which each form a portion of at least one of said bearing means, said bearing means parts being connected through a connection means which comprises a brazed and/or a soldered connection.

A bearing unit of this type is disclosed in EP-A-1136713. Said prior art bearing
15 unit comprises two deep groove ball bearings which are paired through a soldered connection between either the inner rings or the outer rings thereof. Thereby, a preload can be obtained in the bearing unit. Despite the fact that a solid and stiff connection can be obtained between the two bearings, the application of this prior art bearing unit is limited. The object of the invention is therefore to provide a construction unit, and in a
20 first embodiment thereof a bearing unit which comprises a brazed or soldered connection which is more versatile. This object is achieved in that the connection means also comprises a further connection, e.g. a welded, screwed and/or a plastically formed connection.

By providing both a brazed or soldered connection, as well as a further
25 connection such as a welded connection, a screwed connection, a plastically formed connection or e.g. a clamp or clip ring connection it becomes possible to provide a wider range of specific bearing units than paired ones. As an example, reference is made to a bearing unit comprising two series of rolling elements which are each in contact with a raceway of one of the ring means parts, wherein each ring means part is
30 connected to an auxiliary ring part through a brazed connection, and said auxiliary ring parts are connected to each other through a welded connection.

The ring means parts can be of a steel type which is particularly fit for rolling contacts. In contrast, the auxiliary ring parts can be selected from steel types which

enable a desired welding process to be carried out, e.g. a laser welding process. In this way for instance the ring means parts and the auxiliary rings together constitute the inner ring means. At the same time a specific bearing play or bearing preload can be obtained. The invention is applicable to all kinds of bearings, including rolling element bearings and plain bearings.

In a second type, the invention is related to a bearing assembly, comprising at least two bearing means which are displaceably supported with respect to each other, wherein the parts of the construction unit are carried out or at least one of the bearing means and/or a part thereof and an auxiliary unit, which is connected through a connection means comprising a brazed or soldered connection to said at least one bearing means and/or said part thereof. According to the invention, said bearing assembly also comprises an auxiliary element which through the brazed or soldered connection, may be connected to the bearing unit. As an example reference is made to auxiliary elements carried out as e.g. additional supports for specific bearing unit applications, such a wheel bearing units. Also, brake drums, brake disks, vanes for cooling purposes etc. can be mounted in this way to a bearing unit.

The major advantage of the bearing units addressed before is related to ability to apply welding techniques. The application of welding techniques is usually limited to low carbon steels. In the field of bearing units however, high carbon steels are applied. A welding process performed on such high carbon steels would lead to the development of severe welding imperfections which are detrimental to the functionality of the bearing unit. Only by means of extreme precautions some of the problems associated with the welding of high carbon steels can be mitigated. Very often however such precautions cannot be applied due to handling problems and heat input.

As an example, reference is made to the following steel types. A very common bearing steel is SAE51200 or DIN100Cr6, which has 1wt% carbon and 1,5 wt% chromium. Reference is also made to induction hardening steels such as SAE1070 and SAE1055. For applications with higher demands, special steel types have been developed such as Werkstoff number 1.3503, 1.3501, 1.3520, 1.3536, 1.3543, 1.3549, 1.3551 and 1.3553. In addition, stainless steels for bearings include AISI 440C and D. The high speed steel M50 is applied for aircraft bearings. These types of steel have in common a high carbon content as well as alloy elements which are carbide formers. the carbon in these steel types is responsible for the high hardness; the alloy elements such

as Cr, Mo provide an improvement in the hardening depth. In general, welding of said steel types is not feasible.

The invention also encompasses the brazed or soldered connection of a plastically formed or formable auxiliary element to the bearing unit. For instance, such a
5 plastically formed or formable auxiliary element can be brazed or soldered onto the ring of a rolling element bearing. Subsequently, said bearing can then be attached to e.g. a suspension member, such as a steering knuckle, by means of the plastically formed or formable element.

The auxiliary element thus connected to the bearing unit may also serve other
10 purposes than connecting the bearing unit to its suspension. For instance, the auxiliary element may serve as an intermediate flange onto which e.g. mounting parts of a disc or drum brake are welded; also components such as sensor housings, brake adapters etc. may be connected in this way.

The invention will now be described further with reference to the embodiments
15 shown in the drawings.

Figure 1 shows a bearing unit according to the invention with brazed, welded and forged connections.

Figure 2 shows a bearing unit with a screwed connection.

Figure 3 shows a bearing assembly according to the invention with a brake drum
20 connection.

The hub bearing unit shown in figure 1 is given as an example for illustrating one specific embodiment of the invention. It is to be noted that the invention is however not limited to such kind of bearing unit, but that other bearing units with different kind of rollers or of other types are also within the scope of the invention.

25 The hub bearing unit shown in figure 1 has an outer bearing means 1 and an inner bearing means 2 which each comprise cone shaped raceways 3 up to 6. Between the cone shaped pair of raceways 3, 5 series of conical rolling elements 7 is accommodated, between the pair of conical raceways 4, 6 a series of conical rolling elements 8. These elements 7 respectively 8 are separated from each other by means of
30 a cage (not shown).

The outer ring means comprises outer ring means parts 9, 10, which are mutually connected through the connecting means 11 according to the invention. The connecting means 11 comprises two intermediate ring parts 12, 13, which are each, through a

respective brazed or soldered connection 14, 15 to a respective outer ring means part 9, 10. In turn, the intermediate ring parts 12, 13 are connected to each other by means of the weld 16.

5 The advantage of this lay-out is that the ring means parts 9, 10 can be made of a steel type which is in particular fit for rolling bearing applications, that is a high carbon steel type. In contrast, the intermediate ring parts 12, 13 may consist of a low carbon type steel part which is particularly fit for welding purposes. The intermediate ring parts 12, 13 are themselves by means of a brazed or soldered connection 14, 15 connected to the outer ring means 9, 10, which means that a strong and stiff connection
10 is obtained without however subjecting these high carbon outer ring means parts 9, 10 to extreme temperatures.

The inner ring means 2 comprises a hub ring 17 which carries one of the inner conical raceways 5. The other inner conical raceway 6 is accommodated on a ring piece 19 which is slid onto the cylindrical surface 20 of the hub ring 17 and the
15 corresponding cylindrical surface 21 of the connection ring 18. To that end, the original shape of the connection ring 18 is fully cylindrical so as to enable the sliding action for positioning of the bearing ring 19.

Through a brazed or soldered connection 22, said connection ring 18 is connected to the hub ring 17. Subsequently, by means of a cold forming rolling process, the bead
20 23 is formed. During the formation of this bead 23, the bearing ring 19 is brought into its final position, and the preload (against the abutment 42) or preplay envisaged is obtained within the bearing unit.

In the alternative shown in the lower half of figure 1, a connection means 24 is applied comprising a connecting sleeve 25, connected to the hub ring 17 by means of a
25 brazed or soldered connection 22. A radially outwardly extending ring 26 is connected to the connecting sleeve 25 by means of the weld 27. When applying the ring 26, the required preload or preplay can again be established in the bearing as in the former case.

The alternative of figure 2 is to a large extent similar to the embodiment of figure
30 1. It shows a connection means 28 consisting of a sleeve 25, onto which a ring 29 is connected by means of a screw threaded connection 30. Also this screw threaded connection can be used to obtain the required preload or preplay.

Figure 3 shows a final embodiment, according to which a brake drum 31 is connected to the hub ring 17 of figure 1 through the connection means 36. To that end, by means of the brazed connection 32 an auxiliary element 33 with a T-shaped cross section is connected to the hub ring 17. Finally, by means of the weld 34, the brake
5 drum part 35 is connected to the auxiliary element 33.

Claims

1. Construction unit, comprising at least two metal means parts (9, 10; 17, 19; 17, 35) which are connected to each other through a connection means (11; 18; 24; 28; 36) which comprises a brazed or a soldered connection (14, 15; 22; 32), characterised in that the connection means (11; 18; 24; 28; 36) also comprises at least one further connection, e.g. a welded (16; 27), screwed (30), glued or a plastically formed connection (23).
2. Bearing unit, provided with a construction unit according to claim 1, said bearing unit comprising at least two bearing means (1, 2) which are displaceably supported with respect to each other, wherein the metal means parts (9, 10; 17, 19; 17, 35) of the construction unit are carried out as bearing means parts (9, 10; 17, 19; 17, 35) which each form a portion of at least one of said bearing means (1, 2), said bearing means parts (9, 10; 17, 19; 17, 35) being connected through a connection means (11; 18; 24; 26) which comprises a brazed and/or a soldered connection (14, 15; 22; 32), characterized in that the connection means (11; 18; 24; 28; 36) also comprises at least one further connection, e.g. a welded (16), screwed (30) glued or a plastically formed connection (23).
3. Bearing unit according to claim 2, wherein the bearing means are carried out as ring means (1, 2) which are rotatably supported with respect to each other, at least one of said ring means (1, 2) comprising ring means parts (9, 10; 17, 19) which are connected through a connection means (11; 18; 24; 28) which comprises a brazed and/or a soldered connection (14, 15; 22), characterized in that the connection means (11; 18; 24; 28) also comprises at least one further connection, e.g. a welded (16; 27), a screwed (30), a glued or a plastically formed connection (23).
4. Bearing unit according to claim 3, wherein at least two series of rolling elements (7, 8) are provided which are each in contact with respective raceways (3, 4) of both ring means parts (9, 10), wherein each ring means part (9, 10) is connected to an intermediate ring part (12, 13) through a brazed connection (14, 15), and said

intermediate ring parts (12, 13) are connected to each other through a welded connection (16).

5 5. Bearing unit according to claim 3 or 4, wherein at least two series of rolling elements (7, 8) are provided which are each in contact with respective raceways (5, 6) of both ring means parts (17, 19), one of said ring means parts (17) comprising an abutment (42) and being connected to an intermediate ring part (25) through a brazed connection (22), said intermediate ring part (25) comprising a flange (23, 26, 29) which is positioned at one axial end of the other ring means part (19), the other end of which
10 abutting against said abutment (42).

6. Bearing unit according to claim 5, wherein the flange (29) is connected to the intermediate ring part (23) through a screw connection (30).

15 7. Bearing unit according to claim 5, wherein the flange (26) is connected to the intermediate ring part (25) through a welded connection (27).

8. Bearing unit according to claim 5, wherein the flange (23) is obtained through plastic deformation of the intermediate ring part (25).
20

9. Bearing unit according to any of claims 3-8, wherein the ring means parts (9, 10) and the intermediate ring parts (12, 13) together constitute an inner ring means (2) and/or an outer ring means (1).

25 10. Bearing unit according to claims 2-9, wherein the connection means parts (18; 24; 28; 36) have concentric facing surfaces which enclose a layer of brazed material (22; 32).

30 11. Bearing unit according to claim 2, wherein the bearing means are slidably supported with respect to each other.

12. Bearing unit according to any of the claims 2-11, wherein the connection means comprises a relatively high grade material, e.g. a low carbon, high strength steel material, stainless steel or non-ferro materials like copper alloys, nickel alloys etc.

5 13. Bearing unit according to any of the claims 2-12, wherein the connection means comprises a light weight material, e.g. aluminium, titanium, magnesium or their alloys.

10 14. Bearing unit according to any of the claims 2-14, wherein at least one of the bearing means and/or the connection means comprises a ceramic component.

15 15. Bearing assembly provided with a construction unit according to claim 1, said bearing unit comprising at least two bearing means (1, 2) which are displaceably supported with respect to each other, wherein the parts (1, 2) of the construction unit are carried out or at least one of the bearing means (1, 2) and/or a part (9, 10; 17, 19) thereof and an auxiliary unit (31), which is connected through a connection means (36), comprising a brazed or soldered connection (32) to said at least one bearing means (1, 2) and/or said part (9, 10; 17, 19) thereof, characterised in that the connection means (36) also comprises at least one further connection, e.g. a welded (34), screwed, glued
20 or a plastically formed connection.

16. Bearing assembly according to claim 15, wherein the auxiliary unit comprises brake means, e.g. a brake disc or a brake drum.

25 17. Bearing assembly according to claim 15, wherein the auxiliary unit comprises a cooling element, e.g. a vane member.

18. Bearing assembly according to claim 15, wherein the auxiliary unit comprises a mounting flange (44).

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